SESSION I

Section 1

ALTERNATE ENERGY'S ROLE IN GENERATING ELECTRIC POWER

L. Papay
Senior Vice President

Southern California Edison Company

INTRODUCTION

After years of steady and rapid growth and financial prosperity during the 50s and 60s, the U.S. electric utility industry entered an era of unprecedented change and turbulence in the 70s. This tumultuous period was characterized by several significant and unanticipated events which took many utilities off-guard and fundamentally changed the way the industry manages and plans its future.

The underlying reasons for these changes may be attributed to four primary factors:

- Starting in late 60s, the industry went from a decreasing cost to an increasing cost industry. Economists have attributed this to going from rapid technological advancements and economies of scale in power generation to stagnant technology and dis-economies of scale;

- Also starting in the 60s, the environmental movement in the U.S. forced the internalization of the side-effects of power generation. Previous to this time, the environmental impacts of existing or planned operations were considered to be incidental to other planning functions;

- In 1973-74 and again in 1979-80, the price of oil -- and all other forms of energy -- increased substantially resulting in major shifts in energy consumption patterns, substantial gains in energy utilization efficiencies and interfuel substitution; and

- Two unprecedented and prolonged economic recessions in 1974-75 and 1980-82 accompanied by high inflation and unemployment rates resulted in structural changes in the composition of the U.S. economy away from energy intensive heavy industries to light manufacturing and service industries.

The combined effect of these events has been slower than historical growth rates for the electric utility industry since the mid 70s and a fundamental re-evaluation of the industry's time honored heavy reliance on large, long lead time power generation options.

The central theme of this re-evaluation has been focused on new options and alternative power generation technologies. This has been necessitated by energy price volatilities, uncertainties in future load growth, and new financial constraints.

I would like to share with you our perception of what these uncertainties entail, and their implications for alternate energy's role in generating electric power.

A NEW BALL GAME

The four fundamental events of the 60s and 70s alluded to in the Introduction, have left some permanent and transitory marks on the U.S. industry, and the electric utility industry is no exception. What makes our industry unique, however, is that it is one of the most capital-intensive and most heavily regulated. The combined effect of these two characteristics is that our industry has been a long-lead time industry, making decisions and committing billion dollar investments that extend a decade or more into the future. As a result, the uncertainties brought about because of the developments of the past decade have been particularly unsettling.

I will use a sequence of figures to illustrate this point. Prior to the 1973 oil embargo, with plentiful supplies and falling oil prices, many utilities, including Edison, were heavily dependent on oil and gas fired generation to satisfy their customers' electrical needs. With the energy price shocks of 1973 and the passage of the Fuel Use Act, the prudent policy was to reduce dependence on oil and gas almost at any cost. And many utilities, including Edison, took President Carter's message that "the quest for energy independence should be looked upon as the moral equivalent of war" literally.

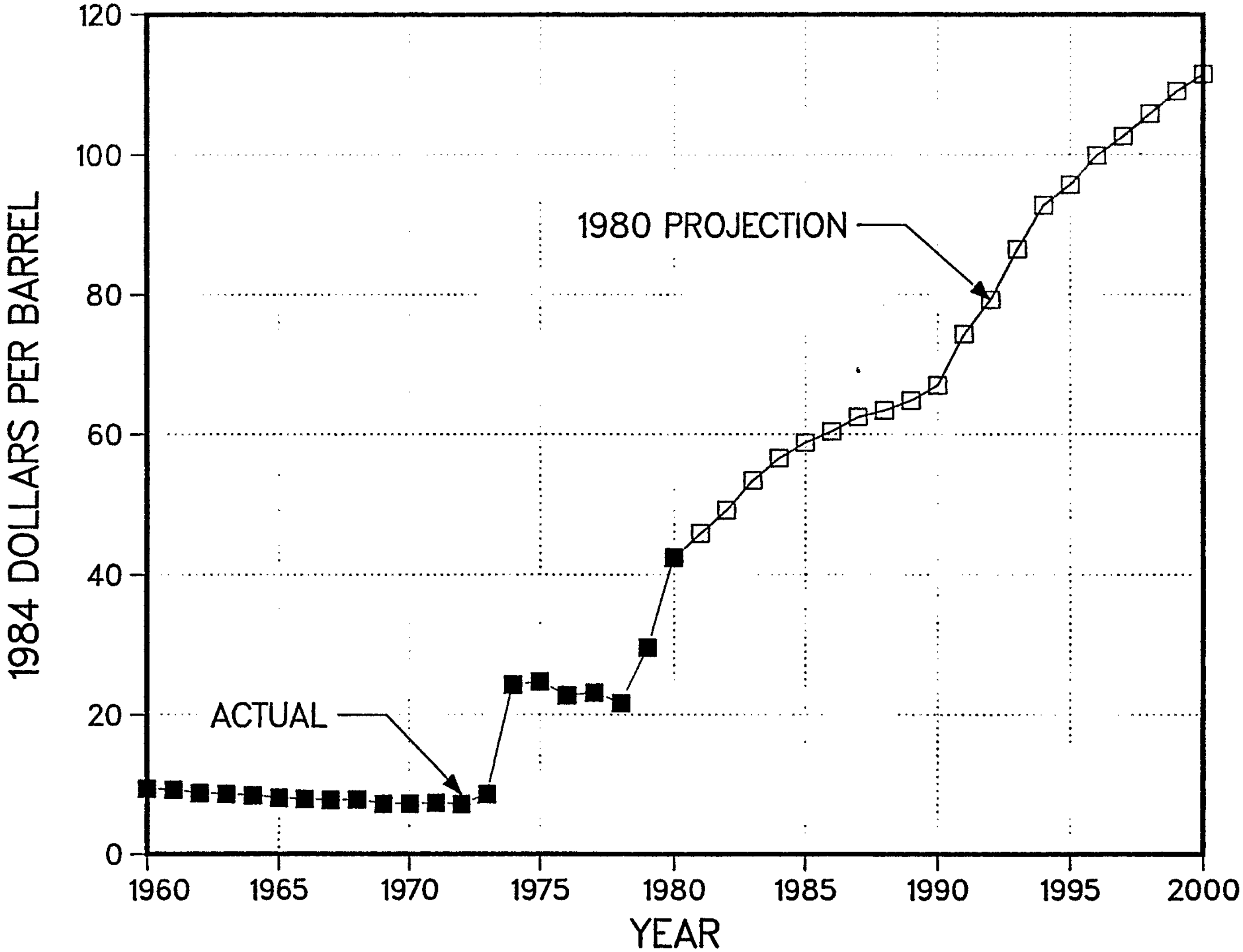
The prudence of this policy was further reinforced in 1979-1980 with the second oil price shock. Looking at Figure 1, one can sympathize with the near unanimous concensus on future price of oil as exemplified by the DRI's 1980 projections. Notice that the entire figure is in terms of constant 1984 dollars, hence eliminating the effects of inflation.

The expectation of high and rising oil prices resulted in a flurry of activities at U.S. utilities, all designed to back off oil and gas and to diversify energy supply sources. Edison's response to the problem was a radically different energy resource strategy which placed heavy emphasis on renewable and alternative energy resources. This strategy -- announced in late 1980 -- established a goal to provide one third of Edison's new resource additions for the decade of the 80s from renewable and alternative energy resources.

Although the strategy's major objective was to reduce Edison's dependence on unreliable supplies of oil and gas and diversify our primary energy sources, it had another significant benefit.

By relying on smaller, short lead-time units, Edison could better match its capacity additions to uncertain demand growth, hence increase the flexibility of its resource plan. Simultaneously, the new strategy would reduce Edison's financial requirements and investment risks. Thus, the concept of "modularity", which was not considered to be important in the 50s and 60s, was recognized as a necessity for the uncertain 80s and 90s.

FIGURE 1.
ACTUAL & 1980 PROJECTIONS OF OIL PRICES



Our efforts in acheiving this ambitious goal have been highly successful. Today we have 446 megawatts of new renewable and alternative capacity in operation on the Edison system. In addition, we have commitments for an additional 2,856 megawatts, including facilities either under construction or represented by signed contracts. Edison's present commitments far surpass the original 1980-1990 goal of 1,900 megawatts. In fact, the program has been so successful that we have revised our initial goal upward by an additional 1560 MW and are now seeking a total of 3,460 megawatts of capacity based on renewable and alternative resources by 1994, and 95% of that is already under contract.

The past several years have been exciting ones for Edison as pioneering solar, geothermal, and coal gasification plants have been added to our system. With the addition of Solar One, the world's largest solar-thermal, central receiver power plant in 1982, Edison became the first utility to generate electricity from nine primary energy resources -- oil, natural gas, wind, geothermal, coal, nuclear, water, solar, and biomass -- more than any other utility in the world.

At the same time, Edison's dependence on oil and gas has dropped from a 1973 high of 67 percent to slightly over 30 percent in 1984, and is expected to drop to around 19 percent by 1994. Similar success stories abound across the country attesting to the industry's ability to respond to the changing times.
The corresponding numbers for oil and gas use by utilities for 1973, 1984 and 1994 are 34, 17 and 16 percent, respectively.

Returning to the 1980 projection of oil prices in Figure 1, it is easy to see why we at Edison -- and others -- were enthusiastic and highly optimistic about the future potential of renewable and alternative technologies. With high and rising oil prices, everybody was projecting rapid development and deployment of new technolgies. It simply was a question of time before a new technology would become cost-competitive with oil and gas-fired generation.

Two additional factors were helping this euphoria. One was the great expectation that, with accelerated RD&D, new technologies would become commercialized and deployed in mass numbers within a few years. The federal government, particularly the Department of Energy, was spending large sums of money on RD&D following the 1973 oil embargo on everything from geothermal and solar energy to more exotic technologies such as OTEC.

The second was the introduction of financial incentives such as tax credits and accelerated depreciation which reduced the effective costs and risks of investment in new technologies. The passage of the Public Utility Regulatory practices Act of 1978, better known as PURPA, provided yet another impetus for rapid development and deployment of new technologies.

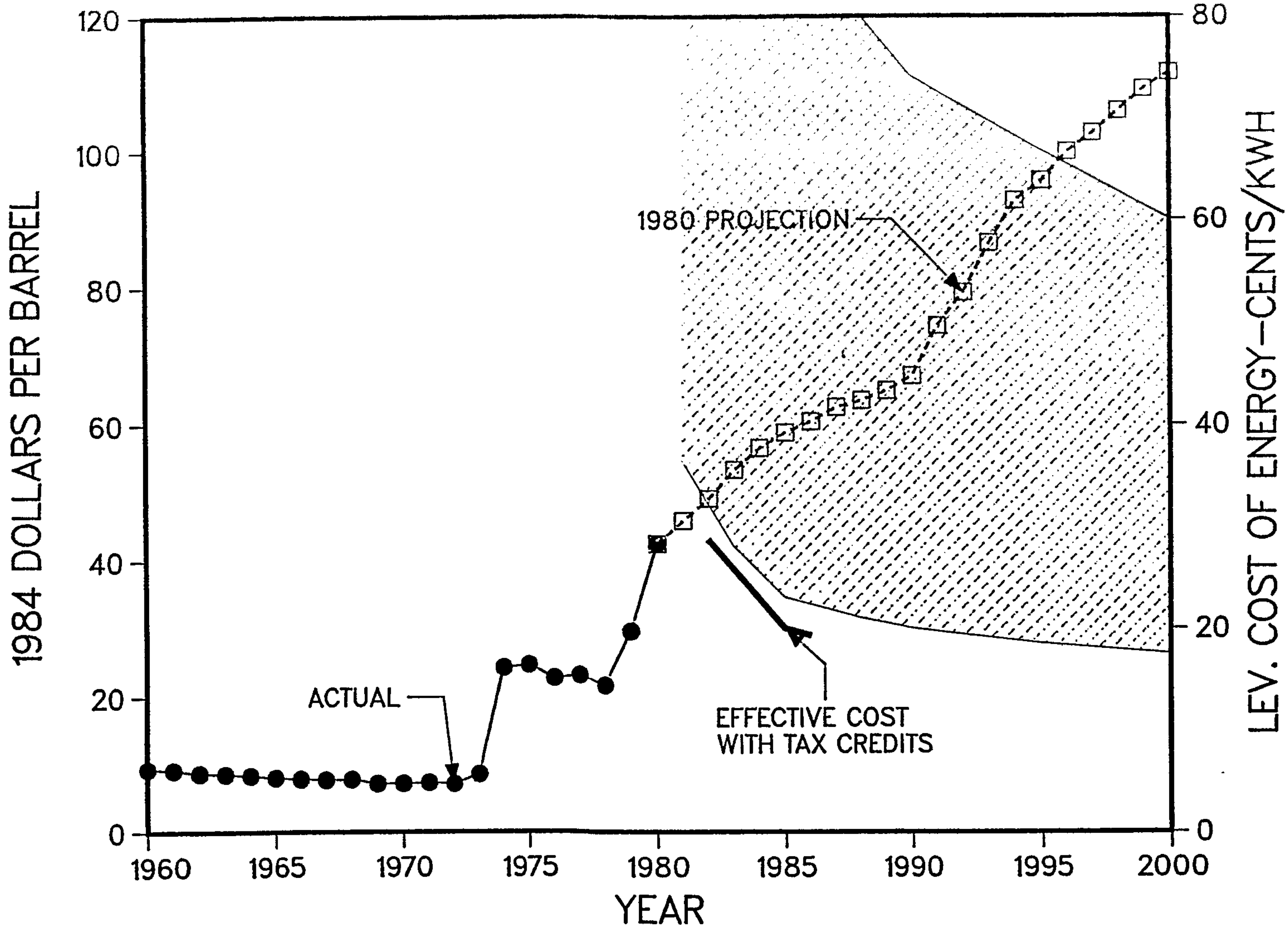
Combined, these three factors resulted in a self-fulfilling prophecy where virtually any new technology -- including some exotic technologies in early stages of RD&D -- were expected to become cost-competitive with oil and gas fired generation within the decade of the 80s. Rapid market penetration and mass production, it was argued, would follow initial introduction, which would further reduce costs, hence accelerating their deployment. And since the price of oil was assumed to continue to rise, the whole story enjoyed a great deal of public support. Furthermore, these new technologies were touted as environmentally clean and devoid of any adverse impacts.

Figure 2 illustrates this point by superimposing cost goals for renewable and alternative technologies on projections of future price of oil.

The cost goals for renewable and alternative technologies are shown as a band representing the full spectrum of new technologies. The upper end of the band represents the more exotic, less developed technologies and the lower end of the band represents the more developed and mature technologies.

The entire cost band is shown as falling over time because of technological advancements and because additional RD&D reduces both the cost and cost uncertainties associated with new technologies. Hence the distance between the top and the bottom of the band is also falling with the passage of time.

FIGURE 2.
1980 OIL PRICE PROJECTIONS &
COST GOALS FOR NEW TECHNOLOGIES

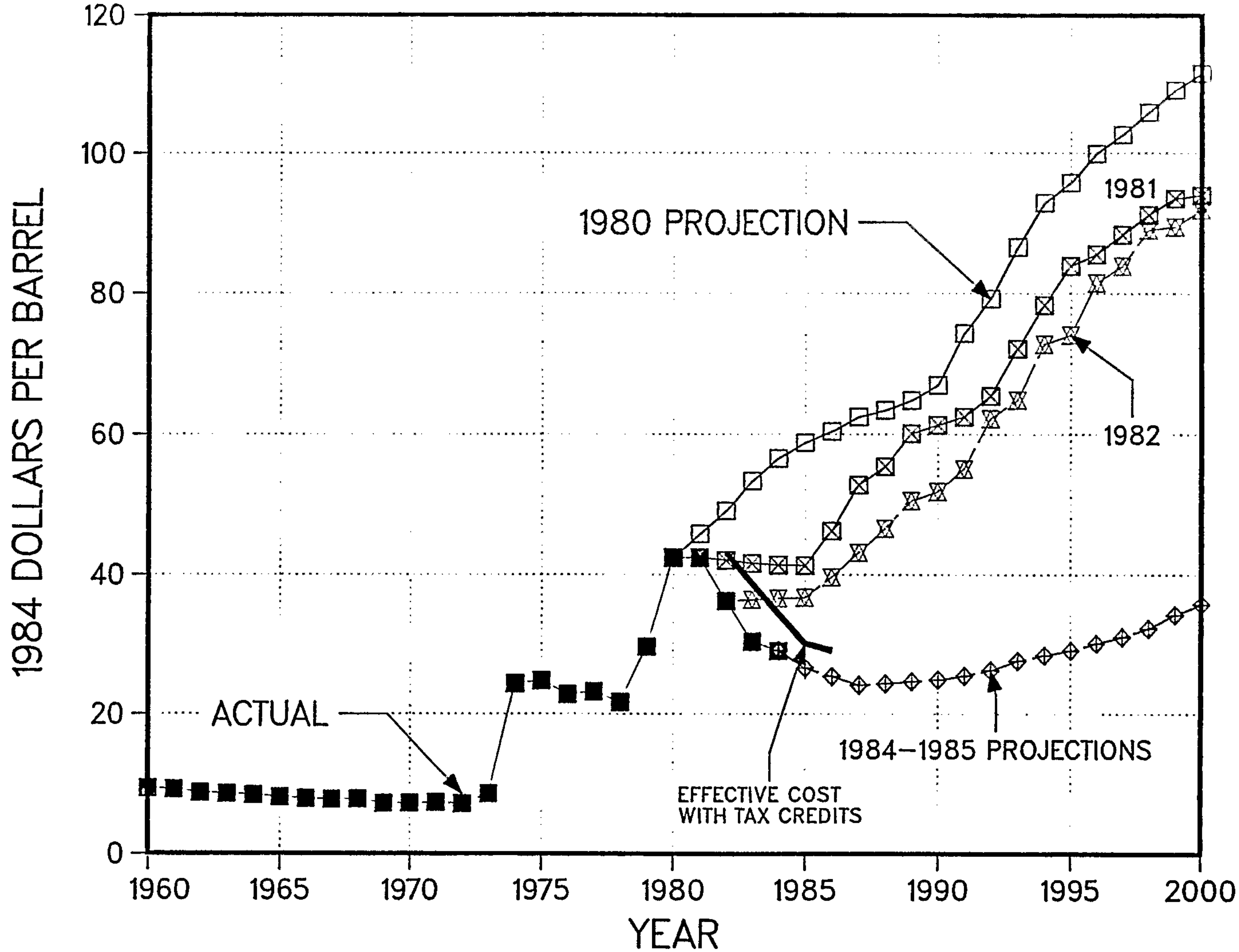


The solid line parallel to the lower end of the band represents the effective cost of the more mature technologies with tax credits and other financial incentives. Small wind machines, which have proliferated in the past several years, are an example of such technologies that were helped by these financial incentives.

Of course, generous tax credits and other financial incentives did help some technologies such as wind flourish and there are many examples of thriving wind parks in California and elsewhere. Similarly, increases in RD&D funding did help some technologies move from the pilot stage of development to pre-commercial demonstrations and small-scale applications. But the third and most crucial assumption underlying the optimistic projections did not materialize. As the world-wide demand for energy fell because of recession and improvements in energy utilization efficiency, an unexpected oil glut emerged and the price of oil started to drop.

As shown in Figure 3, successive projections of the price of oil in 1981 and 1982 began to show a softening in future oil prices. By the time the 1984-85 projections came out, everybody became painfully aware that it was altogether a new ball game! Current projections of future oil prices show a continued decline in real terms through the 80s, followed by a gradual increase in the 90s. The all-time high of $42 per barrel is not expected to be reached again until after the year 2000.

FIGURE 3.
PROJECTIONS OF OIL PRICES
1980, 1981, 1982 AND 1984–1985



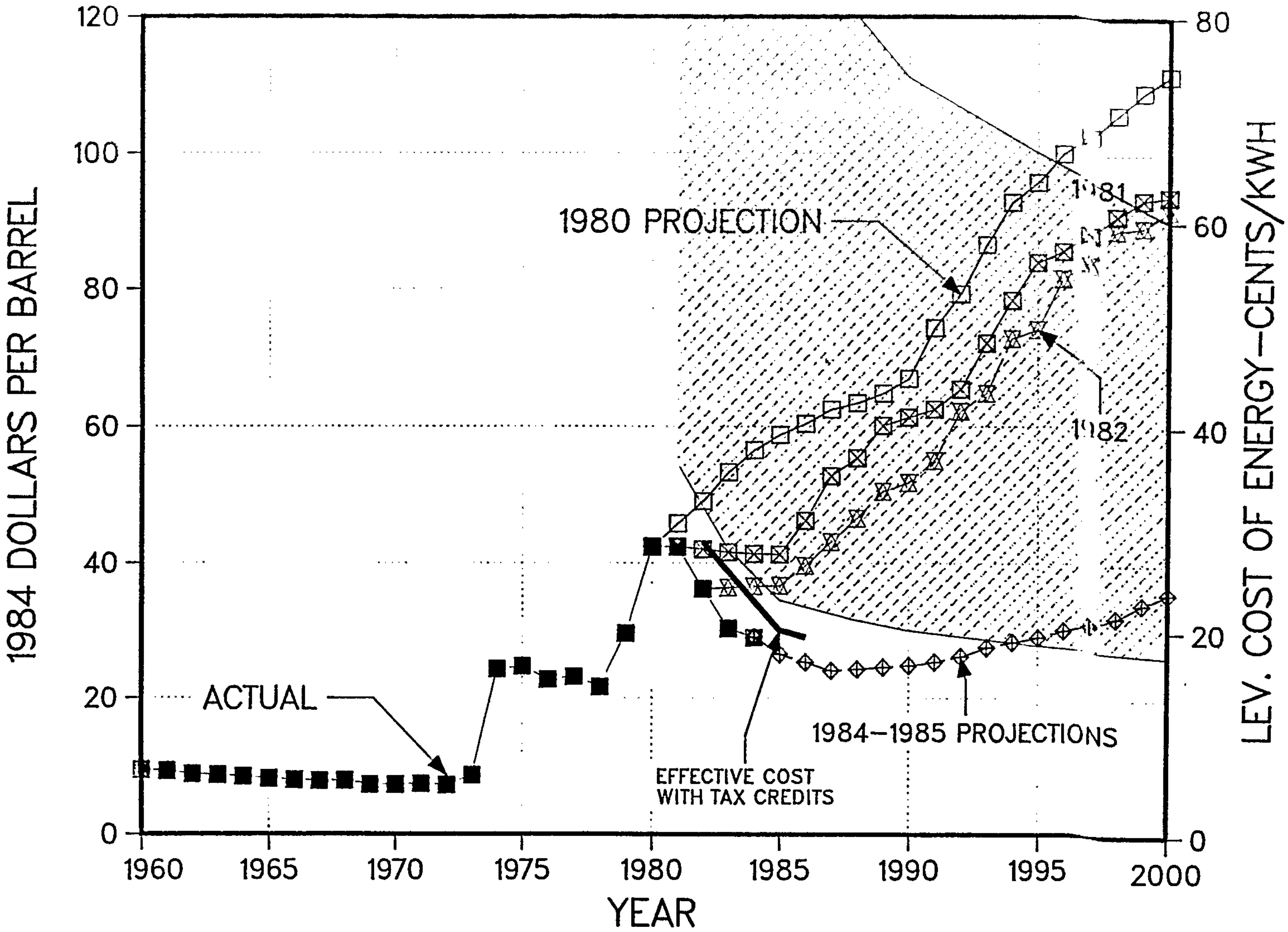
MOVING TARGET

The significance of the price of oil and these falling projections are two-fold. First, the price of oil is often used as a yardstick against which all other energy prices are measured. And the price of alternative fuels tends to rise and fall with the price of oil. Second, and more importantly from the prespective of the electric utility industry, is that fluctuations in the price of oil directly impact the "avoided cost" of energy which for most utilities is their most expensive source of incremental capacity, usually oil-fired combustion turbines.

Thus, with falling oil prices and falling avoided cost of energy and the expected expiration of many tax credits this year, the economic competitiveness of renewable and alternative technologies have been postponed (Figure 4). The message is clear: technologies that would have been cost-competitive with oil in the 80s based on 1980 oil price projections, will not become cost competitive until the 90s or beyond. For some technologies, however, the crossover point is not expected in this century with the current oil price projections.

If these developments weren't enough, the Federal Government has been cutting back its RD&D budget, particularly for expensive demonstration projects. This couldn't have happened at a worse time since many technologies have advanced to the stage where commercial-scale deployment is awaiting one or more successful large-scale demonstrations.

FIGURE 4.
COST GOALS FOR R/A TECHNOLOGIES



As will be explained later, industry will not invest heavily in new technologies until it has some confidence in their operating performance, and the financial community will attach a high risk premium to such investments unless they are shown to perform successfully in commercial size applications. And here lies a major challenge for our industry to move those promising technologies from pilot-plant scale to commercial-scale demonstrations, and successful industry-wide applications.

RACE FOR COMMERCIALIZATION OF ADVANCED TECHNOLOGIES

The process of research, technology development, demonstration and commercialization may be compared to a relay race, where the baton is passed from one phase to the next until one crosses the commercial feasibility hurdle. In the race for technology development and transfer, a hitch has developed in the demonstration phase of RD&D. Many promising technologies have advanced to the point where commercial deployment is awaiting successful large-scale demonstrations, but regulatory and funding obstacles -- and the perception that the availability of new technologies has been postponed -- hamper the passing of the baton to industry.

We believe that there are several ways to solve this problem. First, the electric utility industry, on average, spends something like six-tenths of a percent of its operating revenues on RD&D. This figure is far below what other industries spend on RD&D to ensure their long-term future as successful companies and industries. Furthermore, it is about half what a recent survey of top executives of the electricity utility industry believe is necessary to spend on RD&D.

Second, we believe that RD&D demonstration projects should be given special consideration because of their importance to commercial applications. Since first-of-a-kind commercial-scale demonstration projects are not generally cost-competitive with conventional technologies, special provisions are necessary to share the costs and the risks. Current arbitrary benchmarks such as avoided cost were not intended and, in our opinion, should not be applied to pre-commercial demonstration projects. This is especially true during the present oil glut and period of falling oil prices.

Finally, we believe that much can be accomplished through a continuation of cooperation among the utility industry, its research and development arm, EPRI, high technology vendors and suppliers, and the DOE in areas of common interest. What we have been able to accomplish collectively over the past several years can, no doubt, be exceeded if we pull our technical know-how and financial resources together in pursuit of common goals.

DIFFERENT GOALS FOR DIFFERENT TECHNOLOGIES

Referring once again to Figure 4, it should be apparent that what is needed is a re-evaluation of priorities and a more selective approach towards promising technologies than the "shot-gun" approach which was appropriate in the 70s. We have to be selective in three respects:

First, we have to be more cost-conscious and re-evaluate promising technologies' cost potential more realistically in view of the rapidly changing environment. This suggests that only those technologies which pass the cost hurdle of economic competitiveness in the near to medium term should receive our utmost attention in the near-term.

Second, we have to be more selective by focusing on technologies which meet utility-specific needs and applications such as load-following capability. These system-specific needs and concerns vary from utility to utility and from one region of the country to another depending on a given utility's resources and available options.

Finally, we have to be more selective in how we approach individual technologies in different stages of development. What may be appropriate for a technology in an advanced stage of maturity may be completely inappropriate for a technology in an early stage of development.

Let me give you some examples of what I mean. Take Integrated Coal Gasification, Combined-Cycle Technology or IGCC -- about which you will hear this afternoon. Prior to the Cool Water Coal Gasification Project, IGCC technology had advanced to a stage where a commercial-scale demonstration unit was needed. Aside from the technical uncertainties, two additional problems had to be resolved. First, raising the capital needed to build the demonstration project; and second, some form of price support to reduce the down-side risk of investment due to unforeseen events such as a further softening of the price of oil.

Based on the experience gained to date from this highly successful demonstration project, the utility industry and the financial community is much more confident about the future prospects of this promising technology. Not only have we demonstrated the financial and technical feasibility of the process, but the cost and performance uncertainties of IGCC have been reduced to acceptable levels.

More importantly, we have once again demonstrated the effectiveness of cooperation among the industry, EPRI and the private sector to finance, manage and operate a large demonstration project with support of the Federal government in the form of a price guarantee from the U. S. Synthetic Fuels Corporation.

In the case of solar thermal, central receiver technology, as in Solar One, all that has been accomplished to date is the "proof of concept", that is, we have demonstrated that the concept is technically feasible. We believe that more RD&D on alternate working fluids and other components is needed before the technology may be considered commercially viable.

The risks are simply too high for any utility or other commercial entity to undertake at the present time. But the technology is promising and deserves the government's continued support.

Wind technology is on the other end of the spectrum. It has been successfully demonstrated on numerous wind farms, particularly in California. These developments have been helped by energy tax credits and encouraged by utilities through flexible contracts with the developers. Indiscriminate application of tax credits to wind machines of dubious design and poor performance, however, has been criticized.

Fuel cells provide another good example of a promising modular technology with near-term utility applications. Like other modular technologies, fuel cells offer attractive opportunities since the RD&D can be carried out on small modules and the results "multiplied" to produce commercial-scale modular units.

As for longer term options, a technology which holds promise is gas cooled reactor technology. It shares many of the attractive characteristics of renewable technologies, including being relatively small and modular, amenable to shop-fabrication, having short construction time and many passive safety features which makes it inherently safe and environmentally benign. This technology, however, is still in the early stage of development and requires the Federal Government's support before it can be demonstrated for a utility-type application.

With respect to financial incentives, critics of tax credits contend that such incentives unwillingly prepetuate inferior designs and do not help technological advancements. A better incentive would be a tax credit tied to performance or generation, that is, a performance or generation tax credit which rewards actual energy production and creates incentives for improved design, performance, and O&M.

As these examples illustrate, we should be selective not only in our choice of promising technologies but also in our RD&D approach for technologies in different stages of development.

CONCLUSIONS

The foregoing discussion leads one to draw some general conclusions. First, if there is one thing that we have learned from the experiences of the past decade, it is that the future will remain uncertain and unpredictable.

This clearly suggests that we cannot afford to rely too heavily on any one forecast or to get too rigid in our future plans. We should view the future with open minds, maintain many options and plan with flexibility. This approach to planning heavily favors modular, short lead-time technologies.

Another important consideration is that we have survived a period during which a crisis mentality prevailed. The DOE for example, was pursuing many promising technologies simutaneously -- some would say indiscriminantly in the 70s. While this mentality may have been appropriate following the energy crisis of 1973, it is no longer appropriate today.

At the same time, the current oil glut and falling price of oil may be short-lived and do not suggest that we should throw away the baby with the bath water. Instead, we should re-evaluate our technological options in view of today's market realities and reprioritize our objectives.

And as I pointed out earlier, we must be selective in our choice of promising technologies to pursue; selective in terms of their applicability to the industry's needs and opportunities.

Furthermore, we must distinguish among technologies in different stages of development and be discriminating in how we pursue and support technologies in different phases of RD&D.

Finally, the electric utility industry, EPRI, high technology vendors and the Federal government must continue to cooperate in demonstration projects, the final and most crucial phase of RD&D.

Section 2

THE ROLE OF THE SYNTHETIC FUELS CORPORATION

L. Axelrod

Synthetic Fuels Corporation

Thank you and good morning.

It is a pleasure to see so many of you here at this meeting which I think, from the agenda, has the makings of being the best technical meeting on synthetic fuels this year. The good news is that there are so many people still interested in a synthetic fuels program -- the bad news is that you are outnumbered by the U.S. Congress.

Events at the U.S. Synthetic Fuels Corporation have been moving so rapidly that I delayed putting together any notes until just before this meeting. In getting my thoughts together I have had a great sense of deja vu. This is the third Congress that I've seen; I've also worked with two chairmen, three Boards of Directors and four General Counsels. Much is the same--but also much is different.

Speaking of Congress, I would like to set the background by quoting to you from a recent speech of one of the avowed opponents of the SFC. He said,

- "The current blanket of energy security felt by the American public could be thin, indeed. (There are) signs that the progress made over the past decade in addressing problems of supply and demand have slowed, if not reversed.

- In 1984, U.S. oil consumption experienced the first year-to-year increase since 1979, and the largest jump since 1976;

- U.S. oil imports in 1984 increased by over 10 percent;

- From 1973 to 1974, electricity demand grew at an average annual rate of 2.5 percent, but shot up in 1984 by roughly 6 percent: and the gas bubble or abundant supply that became apparent in the late 1970's has lasted longer than anyone anticipated but, with increased demand for gas and the continued reduction of drilling, it is a matter of time before the market tightens.

- The continued dismemberment of our important energy programs will increase the magnitude of our next energy crisis, when it comes, and lessen our ability to deal with it.

  The first major consequence of the current market situation is a reduced incentive for the energy industries to invest. The lower the current demand and prices, the more risky it is to invest the billions of dollars necessary to find and bring to market the energy sources that will meet our energy needs in the 1990's and beyond. We are now witnessing in each of the energy industries a significant slowdown in investments for future energy sources.

  Long lead times are necessary to bring an energy resource into productive use. On every chart I have seen, he continued, the graphs for supply and demand do meet, five to 10 years out, and at that time we will be in serious need of energy supply.

  Because of the current market conditions, there is a question whether the supply will be there to meet this need."

Comparisons of the backgrounds and the compositions of the three Boards of Directors can be equally striking. With each of these we have had to go through a process sometimes beginning with what Vic Schroeder called "Chemistry I A", and work through to the fact that the synthetic fuels industry is not a single homogeneous body, but rather a complex and heterogeneous system of processes and businesses. Doing this in order to provide some conception of what it takes to attract private industry and the commitment of private capital in the view not only of major technical risks, but of gigantic market risks resulting from the vagaries of oil prices.

Let me take you back to 1981.

The Department of Energy had begun to implement the fast-track interim Synthetic Fuels program authorized in the energy security act (ESA). In August 1981 the Reagan Administration determined that this country would continue to implement a commercial synthetic fuels program when the President signed off on the first three DOE projects: Colony, Great Plains, and Union I.

Earlier in 1981 President Reagan had removed all controls on oil prices. Within a few months the world oil market began to stabilize; both consumption and price steadied and then began to decline. Many of us also began to understand that these declining prices, coupled with immature technologies and unnecessary production goals in the ESA would make our job at the corporation more difficult. In recognition of these changing circumstances, the Board of Directors - that was the second board - adopted almost immediately a policy that gave priority to technology and resource diversity over production goals, and the corporation issued stringent technical, financial, and management criteria for projects seeking assistance. Because neither the technical nor market realities of project development were as positive as had been forecast, the corporation's award process has been much slower than proponents of the program had wished.

The corporation has been cautious and deliberate in making its awards, and the success to date of the cool water and Dow Syngas projects reflects this. Neither project is overly large, and both are expected to continue commercial operation after the assistance period ends.

After a hiatus of seven months the corporation has now had a quorum of Directors since December 13, 1984. Since then there have been five Board meetings, including one with our Advisory Committee, and numerous Board Committee meetings. The Board has adopted a statement of objectives and principles and a phase I business plan in line with the action of Congress in the continuing Appropriations Act for fiscal year 1985. We are proceeding with consideration of the six projects for which letters of intent have been authorized, and we are evaluating three other projects under the fourth general solicitation.

I would like to discuss the Board's efforts in all of these areas in some detail with you today.

In describing the corporation's program and objectives in testimony to a Congressional Committee in the spring 1984 we said that the corporation sought to assist an initial group of plants which would represent a mix of technologies, provide experience with all major resources, and produce products which could be readily substituted for imported oil. We further stated that we should do this not in a massive way which might distort the marketplace, but rather in a limited, responsible manner consistent with current realities and competing national priorities. This description of the corporation's broad programmatic objectives remains valid today.

Moreover, another point made in that testimony is important to recall today. In February 1984 Ed Noble testified before that committee that, specifically with respect to achieving the production goals of the Energy Security Act, the Directors had examined a number of possibilities. But given the changed energy and economic conditions, along with the enormous complexity and high cost of constructing pioneer synthetic fuels plants, the corporation had concluded that achievement of the national production goals was probably neither possible nor advisable. In the fall of 1984 the Congress affirmed this conclusion, and at least with respect to the corporation's Phase I program eliminated the production goals.

I point out these key passages from early 1984 corporation testimony because they confirm the overall continuity in the corporation's program despite the various difficulties and changes experienced during the past year. The primary goal has always been and continues to be the award of limited financial support to a number of diverse plants to provide knowledge and experience with the nationally significant synthetic fuel resource/technology options. From this experience will develop the technical and environmental data base and the infrastructure from which the private sector can develop the industry in line with market forces. This will be the Country's "Insurance Policy" against any sustained oil supply dislocation, and it will prepare us to make a smooth and efficient transition to alternative fuels as they become economically justified.

These primary goals and objectives of the corporation have remained consistent, despite changes on the Board, to the law, and in the country's national priorities. Specifically, the statement of objectives and principles adopted by the Board of Directors on January 15, 1985 recognizes a valid national interest in developing a domestic synthetic fuel capability. It states that the corporation's basic objective is to establish a national synthetic fuel capability: This will allow private sector development to proceed efficiently as economically justified, and it will enable the country to expand production rapidly in the event of a sustained energy supply dislocation. The corporation will achieve this objective by providing limited financial support to a diverse mix of commercial scale projects which through their operations will provide knowledge and experience in the resource, process technology, and environmental control areas. On the basis of this pioneer experience, the private sector will be able to make business judgements about further industry expansion, and the country will be able to draw some reasonable conclusions about the extent and timing of emergency efforts to expand synfuel production.

The decision principles set forth in the statement assert that market forces will be the ultimate determinant of industry expansion. The corporation's role is to help establish the necessary information base for efficient expansion by providing contingent assistance in support of strong projects proposing to use those resource/technology combinations of greatest potential national importance. The corporation will assist only commercial scale projects which add significantly to the knowledge base and which are individually judged to be strong in their technological development, management capability, and equity commitment.

In early 1984, we stated that the Board was seeking a mix of technologies and resources. In the Phase I business plan adopted on February 19, 1985 the Board endorsed this approach and set priorities among the various resource/technology options. Priority for inclusion in the Phase I program was given to five coal options, three oil shale options, and two options covering the tar sand/heavy oil resource. It should be noted that of the five priority options for coal, two are presently experiencing significant commercial development, and one of three options for oil shale is also in commercial development.

The development of the coal options is a particularly interesting subject. Back in the 1970's when prices first started to jump and there was a significant shortage of natural gas, the first synthetic fuel plants were designed to make pipeline gas from coal. As economic conditions changed, emphasis shifted to a parallel program for production of liquids by both direct and indirect synthesis. When the whole gamut of synthetic fuel processes were examined, it became clear that fuels from heavy oils and oil shale were less expensive to produce, and that a synthetic fuels industry based on coal conversion would languish for some period of time except for specially sited projects.

About that time, we began seeing projects with a different concept for using coal - the integrated coal-gasification gas turbine combined cycle system for making electricity from coal in an environmentally sound fashion. This concept was pushed to fruition by one of our hosts, the Electric Power Research Institute. Some of the projects resulting from this foresight will be described during the meeting. However, it is already clear that these systems will allow use of all of the coal resources in the United States and will be able to compete favorably and economically with direct coal combustion with a decided advantage in sulfur removal and NO_x diminishment of capabilities.

There is a public perception, at least in some quarters, that nothing has happened for four years in synthetic fuels. This is false. A great deal of progress has been made, particularly considering that market forces during these years were not conducive to alternative energy development. Two commercial entrained flow coal gasification (slurry feed) facilities are operating in this country today. The cool water project has federal support, while the Tennessee-Eastman plant is solely a private sector undertaking. A third version of the gasifier, applicable to different types of coals, will be used in the Dow Syngas plant which is now under construction and scheduled to begin operations in 1987. The Great Plains Facility will provide this country commercial experience with fixed bed coal gasification (dry bottom). That project has completed construction and is presently undergoing start-up.

Within the oil shale options, Union's Parachute Creek Phase I will develop data on oil shale mining and surface retorting. While the project is experiencing a difficult start-up, the various problems are being addressed, and management is confident the project will come on line in due course.

Within the remaining coal, oil shale, and tar sand/heavy oil options given priority in the business plan, the corporation has some projects currently under consideration. In addition, the directors have begun to examine how they might best formulate one or more new solicitations to satisfy programmatic gaps and stimulate industry response to the corporation's needs. Consideration of new solicitation approaches was initiated on February 19, and draft solicitations are being developed now.

The corporation has letters of intent with six projects: The Great Plains, Northern Peat, Parachute Creek, Phase II, Cathedral Bluffs, Seep Ridge and Forest Hill Projects. Since these letters of intent were authorized between July 1983 and April 1984, both external conditions and project specific factors in some cases have changed sufficiently to warrant reconsideration of project configuration. Corporation staff is working closely with project sponsors who are contemplating changes, to determine their economic and/or programmatic advantage and whether and to what extent such changes are permissible within the competitive framework of the solicitation process.

Among its first actions the reconstituted Board of Directors established the comprehensive strategy committee of the Board to formulate the comprehensive strategy required by the Energy Security Act. All five members of the Board chose to sit on this committee. The Committee directs staff through a Matrix Management team composed of the Vice Presidents for Projects, finance, technology and engineering, and the General Council.

The Comprehensive Strategy Committee has been responsible for developing the statement of objectives and principles and the Phase I business plan which have been discussed earlier. These basic documents were essential to affirming the direction of the corporation's Phase I program. They set forth the types of projects the corporation is seeking, provide decision principles on which the Board will base its judgments, and indicate the nature of the economic support the Board will extend to successful projects.

At the March meeting the Board requested the comprehensive strategy committee to develop an initial draft document for consideration in April. The committee is in agreement that the corporation's experience with the solicitation, negotiation, and monitoring of projects will provide the basis for the recommended Phase II strategy. Work is expected to proceed expeditiously and the Board intends to commit all the resources necessary to produce a comprehensive strategy as soon as feasible.

For more than four years the corporation has worked -- struggled is perhaps the more appropriate word -- to put in place a program which reflects the Country's energy and economic priorities, but which also develops the nucleus of a synthetic fuels capability for efficient replication in time of national need. The projects presently before the corporation are by far the most technically mature and financially competent. They have spent many years maturing, and they reflect very substantial private investment. Despite this, some still won't make it. A few others will need restructuring, but the experience and commitment of their sponsors make them appear reasonable candidates for assistance. All of these projects deserve our full and honest consideration and our decision solely on the basis of their individual merit and the national good.

Section 3

THE CURRENT SITUATION OF SYNFUELS DEVELOPMENT IN JAPAN

Shigeo Tagawa
Executive Director

New Energy Development Organization (NEDO), Japan
3-1-1, Higashi Ikebukuro, Toshima-Ku, Tokyo Japan

THE CURRENT SITUATION OF SYNFUELS DEVELOPMENT IN JAPAN

— DEVELOPMENT OF COAL LIQUEFACTION AND GASIFICATION TECHNOLOGY —

Shigeo Tagawa

1. Japan's Basic Energy Situation and the Need to Develop and Introduce Oil Alternative Energy Sources

In looking at the recent petroleum situation worldwide, we see that there has been a reduction in the petroleum consumption level because of energy conservation efforts and the progress in the development of alternative energy sources in developed countries. As a result, the demand and supply situation with respect to petroleum has become eased.

However, in the long- and mid-term perspective, we can anticipate worldwide demand for petroleum to increase again, due to the recovery of the international economy, as well as to the increased demands generated by industrialization in developing countries. Furthermore, with respect to the supply side of the situation, we cannot expect significant increases in supply from non-OPEC countries, and thus, we are likely to be again dependent on OPEC nations. We should also take into consideration the probability that the OPEC nations will return to a policy of conserving their natural resources, once the demand level recovers, and also the fact that the situation in the Middle East is still a very difficult one. Considering these factors, while the petroleum supply and demand situation may be in depressed condition for the time being, in the long-term, the situation must still be described as a pressing one.

Looking back on the experiences of the two oil crises, we should view the worldwide petroleum situation of the future, not on the basis of the immediate situation in which the relationship between demand and supply is eased, but on the basis on a long-term analysis of the situation.

In Japan, the level of oil dependence which stood at 75% in 1977 F.Y. has come down to about 60% in recent years. However, this is still a relatively high figure in comparison with those nations in Europe and the United States which have achieved levels of below 50%. Therefore, we must continue our efforts to conserve energy and to develop and introduce alternative energy sources in a steady and planned way. It is important that through these measures to reduce our dependency level on petroleum (especially on Middle East oil), we redouble our efforts to stabilize the energy supply structure of Japan.

Based on the foregoing factors related to the international petroleum situation, the policies on alternative energy sources must consider the balance of stability of supply and economic efficiency; and we must promote them in an efficient and prioritized manner.

In this broad context, the development of coal liquefaction and gasification technology is one of the important methods along with solar energy, fuel cell, etc., by which resource-poor Japan should seek to overcome its energy limitations through the application of this technolgy.

2. The Significance of the Development of Coal Liquefaction Technology

Given the overall situation facing Japan, if we are to sustain a stabilized development of the national economy and the people's livelihood, we must change that part of our economic structure that creates an excessive dependence on oil, and must make the supply sources of primary energy both diverse and multiple. Securing a stable supply of energy (which is a fundamental factor) is an indispensable prerequisite.

Japan has been making concentrated efforts to develop alternative energy sources with this kind of basic understanding. Among these alternative sources, the development of coal liquefaction technology has the following elements, which make it very significant from the perspective of the national economy.

The first point is that it makes a contribution to the securing of a stable supply of liquid fuel.

Solid coal's disadvantages in terms of transportation and pollution of the environment will be overcome by liquefying it. Thus it can be used as an alternative energy source that directly substitutes for oil. There are a wide variety of alternative energy sources, but most of them are fuels for industrial boilers and for generation of electricity. There are not that many alternative energy sources that can directly take the place of petroleum in the areas of transportation and fuel for household uses. Liquefied coal oil's big advantage, in comparison with coal and most other alternative energy sources, is that it is considered suitable as a liquid fuel for transportation (that is, for fields that are now served by naphtha and middle distillate such as gasoline and gas oil). As such, it is expected to be introduced into fields where naphtha and middle distillate are now used. Given the large reserves of coal and other relevant factors, coal liquefaction makes it possible for us to secure a large-volume, stable supply of alternative liquid energy source. This, in turn, will contribute to the long-term stability of Japan's energy supply structure, and will·also serve as a restraining factor on petrouem prices.

Secondly, by diversifying the energy sources, liquefaction of coal contributes to national security.
Coal liquefaction in itself contributes to the diversification of energy sources by expanding the uses of coal as an energy source. In addition, because liquefaction eliminates the key disadvantages of coal, it increases the number of types of coal that can be used, as well as the volume of coal consumption. That is, it expands the uses of various high sulfur coal low quality coals as energy sources, and it makes the supply of coal from inland regions much easier.
All of this also implies that it contributes enormously to increasing the supply sources of coal. For Japan, which must rely on overseas sources even for most of its alternative energy sources, coal liquefaction makes a great contribution towards dispersing risk in the procurement of energy. To that extent, it significantly enhances Japan's national security.

Thirdly, it represents a substantial contribution by Japan, which is a large energy consuming nation, in carrying out its international responsibilities in the area of developing alternative energy sources.
Technological development is one of the few ways in which Japan can make a real contribution to solving the worldwide energy problem. The development of coal liquefaction technology holds great promise for easing the worldwide energy demand and supply situation through its capability to expand the supply of liquid energy by leaps and bonds; in this sense Japan's contribution is likely to be evaluated highly in the international arena. Furthermore, we must not forget its potential as a form of technological assistance to developing nations with coal reserves.

Fourthly, because coal liquefaction expands both the volume of possible coal consumption, and the range of potential coal uses, Japan's role in its developmet will strengthen our nation's say in the international coal market. Similarly, through our technological assistance to coal producing nations, it can add to Japan's bargaining power. All in all, it will serve to improve Japan's international standing in the area of energy.

Finally, even in spheres beyond energy, we can anticipate additional benefits in terms of bringing about ripple effects on the development of industrial technology. That is to say, the development of coal liquefaction technology entails the mastery, application and further development of advanced technologies in such areas as coal chemistry, steel, petroleum refining, machinery, plant engineering and related areas, and the employment of these technologies and various systems on a large scale. We can anticipate that the outcome of these technological developments will cause great ripples in Japan's industrial technology, especially in the areas related to plant engineering.

3. The State of Development of Coal Liquefaction in Japan

Unlike the United States, West Germany, South Africa, etc., where people involved in coal liquefaction first decide on the type of coal to be used, and then commence the technological development appropriate for a particular type of coal, in Japan, which must import coal from abroad, technological systems must be developed to cope with a wide variety of coal types. From this perspective, we are proceeding with development of liquefaction technology for bituminous and brown coal. Also, parallel to these efforts, we are also developing common coal liquefaction technologies in the areas of equipment, material and so forth.

Furthermore, some private corporations participated in the technological development plants under the United State's SRC-II method (which was cancelled in 1981 prior to designing a demonstration plant) and the EDS method.

Bituminous Coal Liquefaction Technology

Efforts to develop bituminous coal liquefaction technology have been going on since 1975 F.Y. Through experimental room-scale and a bench-scale plant studies, data has been obtained on liquefaction characteristics of various types of coal, reaction conditions and various other aspects of liquefaction. Based on this data, a process development unit (PDU) has been established, and studies are being carried out through its operation.

More specifically a 0.1 to 2.4 tons/day PDU operation and research was conducted with respect to three methods: Direct Coal Liquefaction, Solvent Extractiive Coal Liquefaction and Solvolysis Coal Liquefaction. The research objective was to ascertain reaction conditions, confirm catalysis effects, and grasp the materials balance, so that technological and economic prospects on various kinds of processes could be obtained. In this way necessary data was to be collected for assembling the optimum process for development, starting with a pilot plant project.

When the PDU research reached the final stage, and the time came to shift to a pilot plant project in August 1983, one process was selected that incorporated the advantages and strong points of these three methods, in order to promote the research more efficiently. It was decided, then, to construct a 250 tons/day pilot plant called the "NEDOL Process."

A detailed report on the NEDOL Process Pilot Plant will be made in Session II of this Conference on April 17th by Mr. Ueda of NEDO under the title "Coal Liquefaction Project in Japan—NEDOL Process." The following represents a brief outline of its characteristics:

1) It is capable of processing various types of coal from subbituminous to low quality bituminous coal.

2) Under relatively advantageous reaction conditions, products with a high degree of light distillate can be obtained, and it has a high rate of oil production.

3) It is a process made up of highly reliable unit processes, and its economic efficiency is high.

The NEDOL Process is a single-stage process which promotes liquefaction reaction through the use of high activity iron catalyst. To improve the quality of recycled solvents it includes a solvent hydrogenation unit. The liquefied oil products that are produced by this process are mainly naphtha and middle distillate and the overall rate of oil production is projected to be higher than 50%.

The schedule for the pilot plant research and development project is as follows:

From 1984 F.Y. to 1987 F.Y.	Basic and detailed designing
From 1986 F.Y. to 1989 F.Y.	Construction
From 1990 F.Y. to 1992 F.Y.	Operation

The total cost for this project is estimated to be about ¥100 billion, including operational costs of the plant.

Because the content of the project is on such a large-scale and so complex in character, it is necessary to pull together a really broad range of technological capabilities that encompass the areas of steel, petroleum refining, chemical engineering, heavy machinery engineering and so forth. Therefore, to establish an adequate organizational framework, Nippon Coal Oil Company Ltd. was established in November 1984. This company will gather the necessary personnel from various corporations, as well as the technological and financial resources from both private and public sources, to push the project forward.

Brown Coal Liquefaction Technology

With respect to brown coal liquefaction technology, there is a 150 tons/day pilot plant being constructed in the state of Victoria in Australia, on the basis of an agreement on cooperative energy research and development between the Japanese and Australian governments. The project, which is aimed at the development of liquefaction technology for brown coal in the state of Victoria, is scheduled to be completed by the end of 1985 F.Y.

Its purpose is to carry out research and development to create the optimum technology possible to convert the plentiful coal in the state of Victoria, which is almost unused at the present time, into liquid fuel that can be transported economically, and that can be used as an alternative for petroleum on a commercial basis. By making possible the large-scale utilization of Victoria's brown coal, it not only will contribute to the improvement of the energy situations of both Japan and Australia, but will also strengthen the partnership between Japan and Australia through the medium of a Japan-led technological development effort.

The Victoria brown coal, which is produced in the Latrobe Valley centered around Morwell, has a number of special characteristics compared to brown coal produced elsewhere. That is, it has low sulfur and ash content. Also, it is an extremely porous type of coal, with a porosity rate of more than 40%; in these porosity it contains a large amount of water (the water content is 60%). Therefore, when the coal dries, it powders; in this state, it reacts very easily, and may ignite and burn spontaneously in the atmosphere. For this reason, it is very unsuitable for transportation and storage. Even before the start of the construction of the pilot plant, experimental room-scale and bench-scale plants were used to gather fundamental data regarding reaction conditions and the process structures, etc., so as to be able to select and develop the process most appropriate for this characteristics.

The process is one type of direct liquefaction method, and it consists of two stages of catalysis and hydrogenation. As such, the construction of the plant is also divided into stages: the first stage, when the primary hydrogenation system and related facilities are built, and the second stage, when the secondary hydrogenation system and related facilities are built.

The first stage construction began in November 1981, and was completed last spring (March 1985). The operation and related research with the primary hydrogenation system has been started, and at the same time, construction work on the secondary hydrogenation system has begun. It is anticipated that sometime during 1986, both the primary and secondary hydrogenation systems will be completed, and their operation and related studies will commence.

As stated earlier, this project is being implemented under a basic agreement between the Japanese and Australian governments to "cooperate and promote" together in the project. There is a certain division of labor under which Japan provides mainly technology and capital, while Australia provides mainly the raw material (brown coal), the plant site, water, electrical power and other utilities and elements.

This 150 tons/day pilot plant will serve as the foundation through which we can accumulate the know-how and data that will be indispensable for developing the optimum liquefaction process for the Victoria brown coal, and for other future plans.

In terms of the long-term perspective, after research and development with the pilot plant is completed, and when various economic conditions are satisfied, by the early 1990's, the construction of the first commercial plant is envisioned.

Whether or not brown coal liquefaction will be viable will depend to a large extent on how cheaply and in what volume we can secure the supply of brown coal. On this point, the Australian side has already given us a "guarantee of providing the raw material coal," and so, here too, the future looks very promising, and there is a good prospect for success.

Outline of the project is as follows.

Main specifications of the pilot plant:

- Coal processing capability: Raw material brown coal processing capacity ... 150 tons/day (Dried brown coal ... 50 tons/day)

- Reaction Conditions for the Primary Hydrogenation System:

Pressure:	100 to 200 atm.
Temperature:	430 to 460°C
Solvent/coal (daf):	2.0 to 3.0
Hydrogen consumption:	3.0 to 5.0 wt% on coal (daf)

- Reaciton Conditions for the Secondary Hydrogenation System:

Presusre:	150 to 250 atm.
Temperature:	360 to 420°C
LHSV:	0.5 to 1.5 Hr^{-1}

Particulars on the Main Equipment and Facilities (The maximum equipment capacity):

Coal preparatory processing facility:	3000 Nm^3/Hr
Hydrogen generating equipment:	15 tons/day
Steam vapor generating equipment:	1000 Nm^3/Hr
Nitrogen generating equipment:	2250 tons/Hr

Cooling tower:	2250 tons/Hr
Waste water treatment equipment:	515 tons/Hr
Industrial water equipment:	420 tons/d
Waste gas treatment facility	650 Nm^3/Hr

Plant Site: Morwell district, Latrobe Valley, the State of Victoria, Asutralia (About 150 km southeast of Melbourne)

Total Area: 120,000 square meters

Plant Personnel: Approximately 190 persons (of whom 66 are Japanese)

Equipment and Machinery Technologies Related to Coal Liquefaction

Along with the development of a coal liquefaction process, efforts are being made to develop equipment and machinery technologies necessary to make coal liquefaction commercially viable. These include the following: the development of equipment materials such as material for the reactor which withstands the corrosive atmosphere even under high reaciton temperature; the investigation and selection of different types of coals, in which a wide variety of coals are analyzed to select those types that are suitable for liquefaction; and the development of various process assessment methods for the simulation of coal liquefaction processes.

4. The Significance of the Development of Coal Gasification Technology

Coal gasification technology is a highly effective alternative technology that is capable of providing for high-efficiency electrical power generation by gas/steam combined cycle system or fuel cells, town gas, industrial use liquid fuel, and gases such as methanol, and so forth. As such, it enormously expands the uses of coal. For Japan to develop superior technologies, while fully considering the prevailing domestic and international situation, will contribute greatly to enhancing Japan's bargaining power in the international coal market.

The uses of coal are limited if we confine ourselves merely to the expansion of traditional technologies that have existed up to this point. If we are to have coal serve as one of the main pillars of alternative energy in the future, we must therefore, develop highly efficient and highly economical new technology for coal use from a fresh perspective, and pioneer new potential uses of coal. Only by developing this type of new technology, will the use of coal be accelerated by coal establishing itself as a main alternative energy in the field of gas.

Coal gasification, like coal liquefaction, is based on this outlook. The research and development of coal gasification has the following two main economic objectives in the fields in which it will be used.

<u>For energy uses</u>

a. Electrical power generation: To be cheaper than the conventional coal-firing electrical power by utilizing an integrated coal gasification combined cycle power generation system.

b. Town gas: To be cheaper than such existing fuels as LNG, naphtha, and LPG. Industrial fuels: To be cheaper than such existing fuels as kerosene, LPG, and heavy oil.

<u>For other uses</u> (*For synthetic gases such as methanol and ammonia, hydrogen for direct coal liquefaction and fuel cells, for indirect coal liquefaction, etc.)

It should be more economical than the existing naphtha and natural gas.

From the studies and deliberations that have been carried out, it seems that coal gasification technology will enhance the economic efficiency and viability of coal, and that the above objectives are fully possible to achieve.

It is firmly believed that the development of coal gasification technology will not only contribute economically to Japan's energy but will also have added advantages in terms of a stable supply, handling characteristics, and environment protection. As such, it is a highly desirable area for development.

5. Status of the Development of Coal Gasification Technology

Japan is carrying out three technological development projects for coal gasification under the auspices of the government: (1) project for integrated coal gasification combined cycle power generation, (2) hybrid coal gasification project for industrial use fuels and town gas, (3) multipurpose, high-temperature coal gasification project.

Integrated coal gasification combined cycle power generation project

The technology for integrated coal gasification combined cycle power generation is highly complex, consisting of closely interrelated elements: a coal gasification system for manufacturing gas to be used for gas turbine, a clean-up system to purity the manufactured gas to the level where it can be used by gas turbine, gas turbine generator, and steam turbine generator using the waste heat from the gas turbine. Especially as the final goal is to produce electricity, very strict demands have to be placed on the overall system in terms of reliability and economy.

In Japan, in relation to the development of integrated coal gasification combined cycle power generation technology, there is now a 40 tons/day pilot plant under government sponsorship, using a fluidized bed gasifier. Studies are being carried out on its operation. Simultaneously, the basic design for a 1,000 tons/day demonstration plant is being prepared.

However, because Japan imports most of the coal used for electrical power generation, and because the fluidized bed gasifier may confine Japan to certain types of coal, there is now a feasibility study being carried out on an integrated coal gasification combined cycle power generation process using an entrained bed gasifier.

The operation and research of the 40 tons/day pilot plant is aimed at elementary research of gasifier based on air blown, pressurized, two-stage fluidized bed system, raw gas clean-up system, and technology related to gas turbine combustion chamber. The operation research is scheduled to be completed in 1987 F.Y., now the data is being gathered which will be necessary for the development of the actual-size plant in the future.

The feasibility study for integrated coal gasification combined cycle power generation process using entrained bed gasifier was begun by NEDO in 1983, and is aimed at carrying out various technological and economic assessments on a variety of systems, and is scheduled to produce a basic draft plan for a pilot plant project that uses this process during 1985 F.Y.

In relation to gas clean-up technology, it is anticipated that the thermal efficiency of the integrated coal gasification combined cycle power generation plant as a whole will depend a great deal on the gas clean-up system. Various types of past studies indicate that the hot dry clean-up system has advantages, but it is necessary to make further studies with a full consideration given to technological reliability, development stages, and so forth.

With reference to gas turbine, high-temperature and high efficiency gas turbine is desired. The factors to be considered in the development of this turbine are: unit capacity, compression ratio, number of compression steps, number of turbine steps, number of combustors, etc.

In integrated coal gasification combined cycle power generation, even if we develop high-performance gasifier and gas clean-up facilities, unless turbine technologies of more than 1,300°C level are incorporated, we will not be able to substantially surpass the conventional technology such as pulverized coal-firing generation in the area of thermal efficiency. Therefore, in relation to these factors, it is necessary to define the scope of development and its direction in considering the operation results of the 40 tons/day fluidized bed pilot plant, as well as in the formulation of the basic plan for the pilot plant for integrated coal gasification combined cycle power generation using entrained bed gasifier.

With respect to the technology for integrated coal gasification combined cycle power generation using entrained bed gasifier, the immediate task is to discuss and determine a concrete research and development system and schedule, in order to move on smoothly to the next phase, which is the design, construction and operation of a pilot plant.

Those in the electric power industry in Japan consider the integrated coal gasification combined cycle power generation project to be the top priority task in the area of technological development for the power industry. Based on this recognition, it is carrying out a pilot plant research with a 2 tons/day capacity, along side the national government project. In addition, it is part of a Japanese consortium in the Cool Water Coal Gasification Program, which is actively engaged in this work because of the importance of the project.

As we can see in the Cool Water Coal Gasification Program, accumulating of existing technology is making integrated coal gasification combined cycle power generation more and more practical. However, it is thought that it would be difficult to surpass the conventional pulverized coal-firing power generation in performance and economy by merely combining the existing technology.

Consequently, in developing integrated coal gasification combined cycle power generation technology for commercial application, it is necessary to achieve a higher level of efficiency for key subsystems such as the gasifier, gas clean-up system, and high-temperature gas turbine.

In relation to this task, we should fully utilize elementary research results from the current studies of fluidized bed gasification technology, as well as from the pilot plant project for the development of the planned integrated coal gasification combined cycle power generation with entrained bed gasifier. It is necessary to ascertain the optimal systems in the demonstration plant which is also planned for the future.

According to the basic design for the demonstration plant for the integrated coal gasification combined cycle power generation using a fluidized bed gasifier, it will use 1,100°C class gas turbine for both domestic and overseas coals, and it will be a 1,000 tons/day 100 MW class plant; it is scheduled to be completed during 1987 F.Y.

According to the feasibility study on technology for integrated coal gasification combined cycle power generation with entrained bed gasifier, the basic plan for a 100 to 200 tons/day class gasification pilot plant will be completed by the end of 1985 F.Y. Based on this basic plan, the direction for the construction of the pilot plant will be decided on, and during the period between 1986 F.Y. - 87 F.Y. to 1992 F.Y. - 93 F.Y., the designing, manufacture, installation, as well as operation research of the pilot plant, are scheduled to be carried out.

In selecting a particular system, there are eight pososible combinations, based on: dry feed or slurry feed as the method of feeding coal, air or oxygen as the gasifying agent, and a dry or wet system for gas clean-up. At the present time, the system that is considered most promising involves the following constituent elements: dry feed, air blown, pressurized (two-stages), water-cooled wall, wet clean-up and 1,300°C class gas/steam combined cycle power generating method. With reference to the wet clean-up system, the application of a dry clean-up system will be considered based on the results of operation research being done at the 40 tons/day pilot plant and on other relevant factors.

Hybrid gasification technology development

This project is aimed at the development of hybrid gasification technology in order to manufacture high-calorie gas using the pressurized fluidized bed method. Using coal slurry made of coal and vacuum residues, town gas and industrial use fuel gas are produced.

During 1981 F.Y., 7,000 Nm^3/day PDU was completed, and at the present time, operation research is being implemented. It has achieved a continuous operation of 300 hours and cumulative operation of 1,800 hours. In addition, it has also carried out gasification with coal only. Its operation research is scheduled to be completed during 1985 F.Y., and it has roughly achieved the goal of having the coal gasification efficiency of 70%. At this point, this technological development project has not had any outstanding problems, and the project is proceeding very smoothly.

As far as the supply of fuel gas is concerned, (the provision of which is the immediate objective of hybrid gasification process), there is no worry about the supply of LNG domestically for the forseeable future. It is anticipated, therefore, that it will be sometime before this technology will be implemented on a practical or commercial basis.

Therefore, we must assume that there is no immediate prospect for moving on to the demonstration plant. Rather, in relation to the development of this gasification technology in the coming period, it is necessary to achieve as complete a technological development as possible with the existing 7,000 Nm^3/day plant, so that commercialization will be possible in the future. Consequently, within the operation research up to the end of 1985 F.Y., we will greatly improve reliability, efficiency and processes and acquire design data, engineering data and so on. During 1986 F.Y., the plan is to summarize the work thus far in the form of scale-up design documents for the next phase.

Multipurpose, high-temperature coal gasification project

This is a research and development project to develop multipurpose, high-temperature coal gasification technology that can manufacture H_2 and CO, reliably and efficiently from coal liquefaction residue or from coal itself. The hydrogen gas produced in the process can be used for direct coal liquefaction. Other gases produced include methanol, synthetic gases such as ammonia, gas for fuel cells, industrial use fuel gases, gas for town gas, and can also be used for indirect coal liquefaction, and so forth. Therefore this process has multipurpose uses. This technological development project was started in 1983 F.Y. to develop entrained bed gasification technology, which covers the area where the fluidized bed gasification process cannot be applied because of different gas uses and different types of coal. It started off as an elementary research and materials research aimed toward PDU design and construction. At this point, elementary research and the creation of a part of the testing equipment for materials research have been implemented, and the equipment is being operated. Thus, studies and researches on each element and material are being carried out.

With respect to similar technologies, there are several gasification plants in operation, all aimed at commercialization, such as: the gasifier for ammonia production operated by Ube Kosan Co., Ltd., in Japan, TVA's gasification plant for ammonia production and Eastman Kodak's gasification plant for acetic acid anhydride in the U.S.A.

From these developments, the entrained bed gasification method is gathering more attention as a method of gasification that can be put on an economically viable basis. However, the Texaco system, which is considered closest to practical application at this point, uses the water-slurry feeding system, and it is very difficult to raise the gasification temperature sufficiently. Similarly as it uses a large volume of oxygen, and because of its structural characteristics: the extent to which the size of one plant can be expanded is quite limited.

In Japan, where demands on economic efficiency are extremely harsh and strict, it is crucial that we go ahead with our own distinctive technological development not only to overcome these disadvantages mentioned above, but also to avoid the technological domination by foreign enterprises acting as licensors.

In Japan, as stated earlier, a changeover in gas as raw material will take place, and at the same time, there will be a demand for huge amounts of hydrogen for direct coal liquefaction process, which is expected to be put on a practical basis in the near future. Therefore, the necessity for this technology will be increasing even more.

Long-Term Energy Supply and Demand Outlook

November 16, 1983

Item	FY 1982 (actual)			FY 1990			FY 1995			FY 2000 (estimate)		
Energy demand	388 million kl			460 million kl			530 million kl			(Approx.) 600 million kl		
Energy source	Quantity		(%)	Quantity		(%)	Quantity		(%)			
Coal	94.5	million tons	18.5	108	million tons	17.5	128	million tons	18	160 – 170	million tons	20
(Domestic coal)	(18.3	" ")		(18 – 20	million tons		(18 – 20	" ")				
(Steam coal)	(28.4	" ")		(43	" ")		(58	" ")				
Nuclear	17.3	GW	6.9	34	GW	10.8	48	GW	14	62	GW	16
Natural gas	27	million kl	7.0	56	million kl	12.1	61	million kl	12	64 – 66	million kl	11
(Domestic natural gas)	(2.1	billion m^3)		(4.3	billion m^3		(5	billion m^3)				
(LNG)	(17.6	million tons)		(36.5	million tons)		(40	million tons)				
Hydro (Conventional)	19.4	GW	5.4	22	GW	5.0	24	GW	5	26.5	GW	5
Hydro (Pumped-up)	14	GW		18	GW		19.5	GW		22	GW	
Geothermal	0.4	million kl	0.1	1.5	million kl	0.3	3.5	million kl	1	6 – 7	million kl	1
New fuel oils, new energy sources, etc.	0.9	million kl	0.2	8	million kl	1.7	19	million kl	4	35 – 55	million kl	6–9
Oil	240	million kl	61.9	240	million kl	52.5	250	million kl	48	250 – 260	million kl	42
(Domestic oil)	(0.48	million kl)		(1.5	million kl)		(1.9	million kl)				
(LPG)	(15.7	million tons)		(19	million tons)		(21	million tons)				
Total supply	388	million kl	100.0	460	million kl	100.0	530	million kl	100	600	million kl	100

Notes: 1) The conversion to oil equivalent is based on a thermal value of 9,400 kcal/liter.
2) "New fuel oils, new energy sources, etc." include coal liquefaction, tar sands, shale oil, alcohol fuels, solar energy, firewood and charcoal, etc.
3) The figures in each column are rounded off and do not necessarily give the exact totals indicated below.

N.B.:
1. These estimates for future energy supply and demand assume the systematic accomplishment on a priority bassis of the government's overall energy policy through maximum collaboration and effort by the private sector.
2. Future socio-economic conditions are uncertain, while energy policy requires a realistic and flexible response. In this sense, the target figures in the estimates should be understood as being flexible rather than fixed ones.
3. When the energy conservation rate is taken as the percentage reduction in energy demand per unit of GNP, the energy conservation rate in FY 1990 is estimated as approximately 15% and as over 20% in FY 1995 in comparison with FY 1983.
4. In the light of the long-term nature of energy policy, the energy supply and demand forecasts for fiscal 2000 indicate future energy supply and demand trends on the basis of one scenario.

Long-Term Electricity Supply and Demand Outlook

November 17, 1983

1. Long-term Demand Outlook					
Classification \ Fiscal Year	1982	1990	1995	Annual growth rate 82/90 (%)	Annual growth rate 90/95 (%)
Industrial sector	317.9 (60.9)	376 (57.1)	425 (55.3)	2.1	2.5
Other sectors	203.8 (39.1)	282 (42.9)	343 (44.7)	4.1	4.0
Gross demand	521.7 (100)	658 (100)	768 (100)	2.9	3.2
(Demand breakdown) Electric utilities	471.4 (90.4)	602 (91.5)	708 (92.2)	3.1	3.3
Auto-producers	50.3 (9.6)	56 (8.5)	60 (7.8)	1.2	1.5
Maximum power demand (10^3 MW)	93.19	128	152	4.0	3.5
Annual load factor (%)	61.3	57.1	56.5	–	–

(Unit: 10^6 MWh, Figures in parentheses indicate percent component ratios)

	2. Installed Capacity of Electric Power Plants						3. Generation of Electric Power Plants					
	at the end of FY 1982		at the end of FY 1990		at the end of FY 1995		FY 1982		FY 1990		FY 1995	
	(10^3 MW)	(%)		(%)		(%)	(10^6 MWh)	(%)		(%)		(%)
Nuclear	17.18	12.3	34	19	48	23	101.8	19.5	190	28	285	35
Coal	6.65	4.8	14	8	21	10	35.5	6.8	65	10	95	12
LNG	20.21	14.5	40	23	43.5	21	79.2	15.2	165	24	170	21
Hydro	32.19	23.0	38.5	22	42	21	77.4	14.8	92	13	101	13
Conventional	18.21	13.0	20.5	12	22.5	11	74	14.2	82	12	89	11
Pumped Storage	13.95	10.0	18	10	19.5	10	3.4	0.6	10	2	12	2
Geothermal	0.18	0.1	0.6	0.3	1.5	0.7	1	0.2	4	0.6	10	1
Oil & LPG	63.43	45.3	50	28	49	24	209.8	40.1	150	22	125	15
Others							17.8	3.4	19	3	19	2
Total	139.84	100.0	177.1	100	205	100	522.5	100.0	685	100	805	100

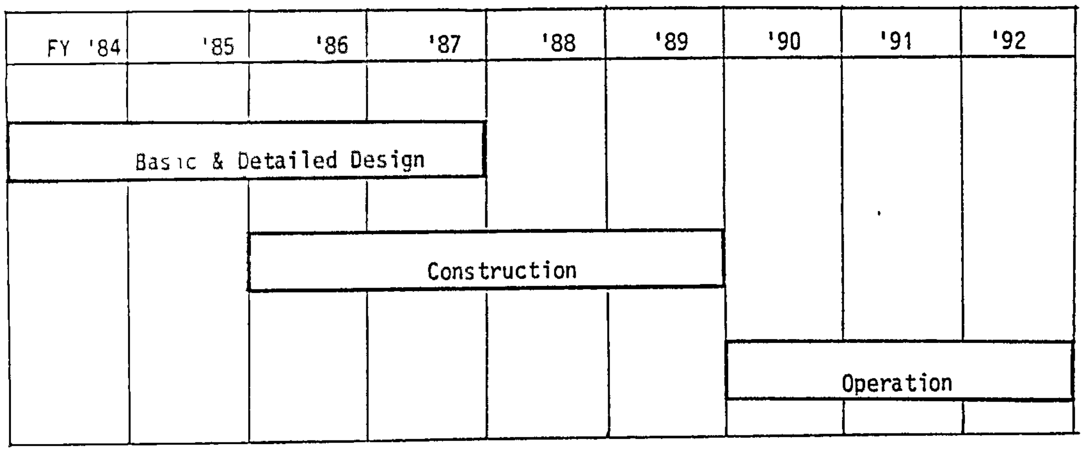
NOTE: Figures for FY 1983

i Gross Demand 553.1 (10^6 MWh)

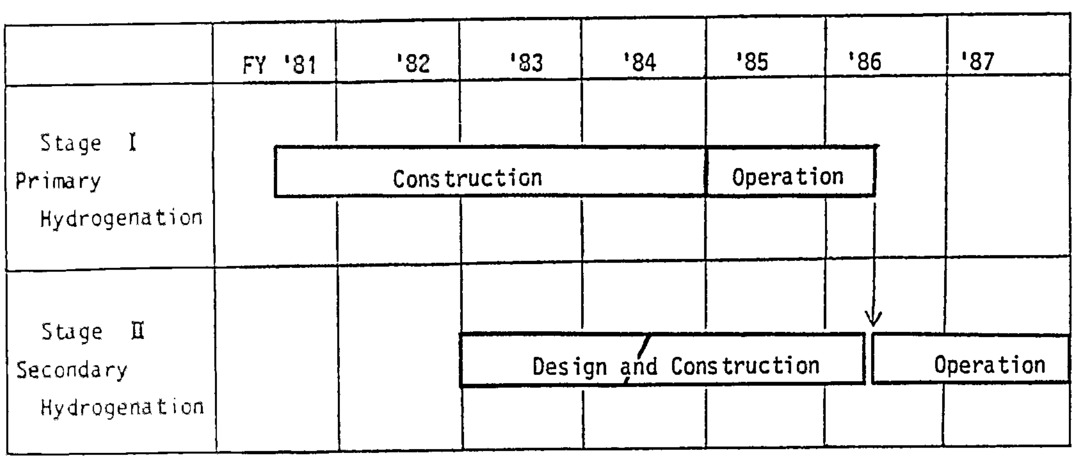
ii Total Installed Capacity 144.26 (10^3 MW)

iii Total Generation 555.5 (10^6 MWh)

Schedule for Bituminous Coal Liquefaction Project (NEDOL Process)



Schedule for Brown Coal Liquefaction Project



Section 4

SUCCESS WITHIN REACH: THE U.S. SYNTHETIC FUELS PROGRAM IN THE SPRING OF 1985

Michael J. Koleda

Council on Synthetic Fuels
Washington, D.C.

Thank you Dwain, for those warm words of welcome.

Conference co-chairman, members of the head table, ladies and gentlemen of this conference ... please accept my sincere congratulations on a most important, timely, and successful effort to spread the "good news." Lord knows we synfuels supporters need all the good news we can get. It's cold out there, Dwain. Leaving the airport in Washington the attendant began ... "Ladies and gentlemen, we will begin by pre-boarding passengers with small children, those who need special assistance, those who support government subsidies for synfuels." It's subtle, but it's out there! Your conference has come just in the knick of time. And timing is the key to synfuels development. Unfortunately, I've always had trouble with timing. I was the last guy to get married before the sociologists declared marriage a passe' institution. No sooner had I settled into the local church, than the intellectuals announced that "God was Dead." Now, as my third child enters college, I read in the <u>Chronicle of Higher Education</u> that a distinguished panel of academics considers a college education a worthless investment! Is it any surprise that the synfuels business began to come apart just as I hitched my star to its fortunes?

Well, it's good to laugh a little at ourselves. As the philosophers might say ... "As long as I'm laughing I'm alive."

But I'm not here to moan and groan. True, progress in synfuels in the U.S. has been far slower than hoped some five years ago. Nevertheless there are signs of emerging successes.

Your companies, your organizations, and your governments are making solid progress in the critically important international field of synthetic fuels development. In some of your countries, strong government support for the steady transition away from oil and toward solid fossil fuels means that you will have the technologies in place and available to license abroad when necessary. The "good news" of solid progress and continued promise of commercial acceptance of coal gasification technology is coming through loud and clear; paper after paper, and in the private discussions of this conference.

This is an impressive and truly international group. I count a dozen nations here represented. And that's not including that "foreign land" on the banks of the Potomac River 3000 miles to the east. I note that the People's Republic of China is represented and I am aware of the potential significance of that nation's interest in exporting energy for the global diversification of energy supplies in the years ahead.

As I preach my sermon tonight I note that the choir is well in place ... you people, from so many countries, are the real heroes of the long and troubled road called synthetic fuels development. There is more knowledge of synthetic fuels technology in this room tonight than at any other location in the world. Truly, this is a special moment for us all. And I am pleased to note the presence tonight of some 20 corporate members of the Council on Synthetic Fuels--the international industry association of synfuels companies--including the Council's Vice-Chairman--Dr. Irving Leibson of Bechtel.

Ours tonight is a warm and friendly group. We think alike. We are sharing the welcome feeling that comes from a degree of success after many long years of trying. We know that with respect to coal gasification, the synfuels situation has "bottomed-out." We know what's happening...the rapidly igniting interest in the "integrated coal gasification-combined-cycle" story fueled by the Coolwater success and the rapid and promising progress of other coal-gasification efforts. Ours is an up-beat mood. And with good reason.

We know that we have crossed the threshold with one synfuels technology. But let's not forget that we did so through the combined efforts of the Electric Power Research Institute, private industry, and government in the form of the Synthetic Fuels Corporation. EPRI and the electric utility industry justifiably can be proud of this significant pioneering effort to bring coal gasification technology one step closer to broad commercial application. And Dwain Spencer especially and his EPRI colleagues deserve our recognition for their steadfast, tenacious, pursuit of this project. We all know that success has 1000 fathers--failure is an orphan. But if ever a paternity suit is lodged against coal gas-combined cycle, Dwain, you are sure to be named!

And at the SFC, despite the storms of protest that have swirled about the Board of Directors, the staff has held the program together. Len Axelrod has been a source of strength and reason throughout these many months. We all owe much to Len, who is with us tonight.

But, there are additional mountains to climb in the effort to develop a broad based synthetic fuels industry to produce liquids, gases, and chemicals from abundant and widely dispersed solid fossil fuels. And we recognize that government assistance will continue to be necessary to lessen the risks of first-of-a-kind technologies to levels the private sector can accept.

And realism requires us to recognize that continued support for government synfuels assistance is far weaker than it was during the energy disruptions of the 1970s. To some extent this is true in all countries. Certainly it is the case in the United States. Our lawmakers in Congress are restless...uneasy...and confused on the subject of synthetic fuels subsidies.

The public is not caught up in discussions of energy policy. No gasoline lines...no liquid fuels problem. No brown-outs... no electricity problems. People have enough to do dealing with the "stuff of their daily lives" to worry about potential energy problems down the road. And corporations know what happens to managements gutsy enough to consider major investments aimed at the long term at the expense of quarterly performance. And, today, a laissez-faire philosophy envelops governments in Washington and abroad. That philosophy seeks to narrow the circle of government responsibility not to expand it. Today, people, corporations, and governments are focused on problems immediately apparent and returns that can be realized quickly.

We have made progress on synthetic fuels, particularly in the coal gasification area. Our challenge now is to keep the momentum going in a difficult climate. In this connection, I want you all to be aware of a newly created entity, the Synthetic Fuels Research Institute. Through that entity, Dwain Spencer of EPRI and I are putting together a meaningful public education program to document our nation's and the world's continuing need for synthetic fuels technologies. We warmly welcome any or all of you to join with us in this most important mission.

Now, I'm no engineer. I've never designed a retort. Until this conference I always thought a "pressurized retort" was the nervous response of a courtroom defendant.

Truth is, I think our challenges in the synfuels area today are less technical and more political--within our companies and within our countries. Certainly, I suspect that to be the case in the U.S.--abroad things are somewhat different. Our perceived energy vulnerability in the U.S. is different than yours. Our perceived price of oil is different than yours. We think oil is relatively cheap. Our friends abroad buying oil with high-cost dollars face a different reality. But both in this country and abroad, technologies are being pushed ahead. Technical problems are being solved. We are "learning by doing." As we do more, we learn more. The result is a broader energy base...and, I remain convinced, lower energy prices in the years ahead for consumers in the U.S. and abroad.

Let's review the U.S. policy context in which technologies for converting solid fossil fuels achieve their support. One aspect of the political debate has to do with the world outlook for oil availability. The other political aspect has to do with increased concern over "acid rain" and the environmental consequences of increased coal combustion in large stationary configurations. What appear to be two different bases of support for synthetic fuels development are in truth closely intertwined.

The strategic arguments for government synfuels support draw attention to the steadily declining reserves of petroleum in the U.S. and among the oil importing nations generally. In time, left alone to market forces there is concern that the U.S., Japan, and Western Europe will drift slowly, inexorably toward far heavier reliance on oil from the fundamentalist nations of the Middle East. I am not speaking here about the acute threat of a temporary supply disruption better dealt with through a strategic petroleum reserve and a readily deployable "Central Command." The concern rather, is the chronic threat of the drift toward far heavier dependence on Middle East oil.

The environmental arguments for synthetic fuels are taking root in the realization that greater reliance on coal is inevitable and technology must be brought to bear to protect the environment. For the first time, rather than fighting the environmental movement--coal burning interests from the mines to the utilities may have a basis for common cause with environmentalists. This is one of the most exciting hopes for coal gasification utility applications.

Interestingly, gasification is receiving financial support from the SFC, an organization whose Congressional sponsors set it up in response to a liquid fuels crisis. Political support for gasification is likely to be found principally in the environmental benefits of those technologies, yet the technologies so developed provide the key information necessary to successfully produce liquids from coal--though their immediate application may be in the utility sector. We take our financial support and our political arguments where they can be found. In the process we steadily add to our knowledge of solid fossil fuel conversion technologies in the country and abroad.

And that experience in the U.S. is steadily mounting.

Today, on the western slope of the Rocky Mountains in Colorado, UNOCAL is struggling to solve spent shale handling problems. Those problems will be solved. The information thus gained will be invaluable to that company and to all of us concerned about the security of energy supplies in the decades ahead. There is the promise of price guarantees once production begins, but for the moment, it is private money on the line, and a lot of it.

In the California desert, the Coolwater project is ushering in a new era in coal-based electricity generation using advanced gasification-combined-cycle technology. As coal gasification makes further progress in the utility industry this project will serve as a reference point for further improvements and even greater efficiencies. This would be a paper project today without the cooperation of industry and government. It is, instead, a classic success story of industry-government cooperation.

West of Bismarck, in the Great Plains country of North Dakota, industry with government help, is demonstrating that pipeline quality gas at commercial scale is a production option for the United States. It is not a good time to be selling manufactured gas...but it is a very important time to be demonstrating technologies for the large-scale production of energy in a world of increasing energy uncertainty. It is a tough time for the companies and an opportune time for the nation.

Technical progress is a cumulative process. These initial projects are less important for the energy they produce than for the knowledge they impart. As each problem in the conversion of solid fossil fuels to liquids and liquid replacements is understood, that knowledge is "in the bank." In the technical arena we don't forget what we have learned only to relearn later at greater cost.

We can't make the same claim in the policy arena. When it comes to policy choices there is no guarantee that a lesson learned once is learned forever. We learn, forget, and learn again at tremendous cost. In the U.S., we may be on the verge of making that mistake once again.

As a kid, I remember my dad--an engineer by training--telling me that the key to problem solving was to exaggerate the important variables so you could see them clearly and to strip away the unessential variables so they didn't block your vision. Unfortunately, I was trained as a economist. And you all know that an economist is simply an accountant without the personality to succeed. But, my dad's advice was sound, and it can help us to "see the woods for the trees" in synfuels policy in the U.S. today. So, let's strip away some underbrush and talk frankly about hardwood issues.

First, on the underbrush side, some of our friends in Washington are anxious to discover the price of a barrel of oil at which various synthetic fuels processes would be brought on by the private sector. Presumably, if the number is reasonable, the synfuels program is reasonable. This is trouble in the making--a dead end. Oh, in theory, I suppose, an enterprising graduate student could construct an infinite number of scenarios, including U.S. and world macroeconomic assumptions, U.S. and world political assumptions, industry and firm-specific assumptions, sociological profiles of Board Chairmen and so forth, going out for a quarter of a century or so, each with its own associated probability or confidence interval. Having done this, I suppose a little heroic discounting could produce a levelized price of oil at which various synfuels plants would be constructed without government assistance. But by then, T. Boone Pickens would have pulled you up short and readjusted your time horizon back to next quarter (or the one beyond if you insist on being a long-range thinker). I suggest we leave the search for the magical price of oil to Indiana Jones. There may be a Journal article at the end of the rainbow, but little else. Let's clear this underbrush aside.

More underbrush. People worry that government assistance to the synthetic fuels industry is inconsistent with free market energy policy. This gives rise to a condition the psychologists call "cognitive dissonance." The tension created when we do one thing and believe another. Good news! It's nothing but an underbrush issue. Free prices--assuming free markets--are the only way to go if your concern is signaling efficient production, consumption, and distribution decisions within a defined market. But, what if your concern is the steady drift toward increasing oil imports increasingly from the unstable fundamentalist Moslem nations of the Middle East beyond the reach of your "rules of the game," where millions of barrels of easily and cheaply produced oil are deliberately "shut-in" for political reasons? This is the situation we face in the United States and the other oil-importing nations face as well. Government assistance to develop long-term domestic energy options to assure energy security outside the scope and beyond the time horizon of the corporate world is as irrelevant to preserving free markets in the United States as it is prudent government policy.

Or suppose government policy--accepted broadly among the body politic--is to promote environmental objectives of clean air and living lakes. Is it so outrageous that these common objectives might suggest some common support for the development of synfuels technologies for burning coal cleanly? Public utility commissioners need to understand the key role they play in helping the electric utility industry move into the promising world of advanced coal technologies like Integrated Coal Gasification Combined Cycle--where coal and the environmentalists may find common ground to bury the hatchet of their age-old antagonisms. Is this so outrageous, just because the government is involved?

My friends, this is the principal hardwood issue at the center of the forest of issues surrounding the synthetic fuels debate in the United States today. It represents the on-going struggle in American society to define under various circumstances and at different times the proper roles and responsibilities of the private and public sectors. If you will...to define where private capability ends and public responsibility begins...to create an environment in which the incentive for private riches doesn't destroy the responsibility for the commonwealth, and vice versa.

The synthetic fuels program in the United States is, in the final analysis, nothing more or less than an effort by government to achieve objectives that would not be achieved as quickly, without government assistance...for reasons fundamentally rooted in the national interest of a secure supply of clean energy at relatively stable prices as far into the future as we can see.

The aircraft industry, the railroads, the communications industry, and countless other industries in American society were given "extra-market" incentives in the pursuit of national objectives that would not be achieved by the market signals alone. It is no heresy that government policy might seek the commercial development of technologies in the energy area at a faster pace than market forces will produce in the national interest of energy security...not just this week, this month, this year, this decade, but far beyond the necessarily shorter horizon of stockholder responsive coporations. No, it isn't heresy. If anything, it is the "American Way" in our mixed economy... at least for many industries...and particularly in the defense- related industries. So why is the synfuels policy of the United States in such trouble?

Let me suggest five reasons:

First, the issue has lost much of its immediate political cachet because the energy crisis is seen as resolved. Energy is plentiful, and prices have been stable or falling. Although the longer-term vulnerability is seen by many in Congress as a serious concern, it is difficult to argue given the choices forced on the Congress by the need to cut the deficit. You think you have a big mortgage.

Second, since 1980, the program has existed, almost solely, as the result of its support among a handful of key supporters in the Senate and House of Representatives, in the absence of Presidential support and in the face of periodic attempts by high-level Administration appointees to eliminate it. We know who these far-sighted statesmen are and we owe them an enormous debt of gratitude.

Third, although a relatively benign form of government assistance, the SFC loan and price guarantees represent a form of government intervention in the fiercely independent energy sector. To some, it is viewed as potentially a first step toward greater intervention in the future. The hostile Congressional hearings of recent years, the extensive reporting of official misconduct charges at the SFC, and the ease with which federal assistance to large energy companies can be demagogued has increased the sensitivity of many major energy companies about doing business with a federal program, at best, weakly supported by the Administration.

Fourth, the dramatic change in the U.S. energy industry since 1980 has resulted in cut-backs and cancellations of capital projects across the board and around the world. Incentives that would have been adequate in 1979-80, are insufficient in today's energy investment climate. The greater incentives required--even if available--would heighten the sensitivities mentioned above.

Fifth, perhaps not surprising given the lack of strong administration support for the original program, the Synthetic Fuels Corporation has enjoyed leadership inconsistent with the historical magnitude and sensitivity of its mission. Much of the first four years was spent defending allegations of misconduct and poor management. That time should have gone toward building industry confidence, establishing a record of progress, and laying a base of congressional and public support. Today we have the supreme irony of two staunch conservatives, each of whom began in strong opposition to the government synfuels program, now vying with one another for the chance to lead it into its finest hour. There must be something to this synfuels business, after all.

We are at a precarious point in the history of synthetic fuels development in the United States. Congressional supporters are fewer and less patient. Congressional critics are better armed than ever to make further program cuts. Only recently, following a valient effort in the Senate and the House to preserve half the program in the face of an effort to kill it outright, voices from the Corporation have suggested that the program is overfunded!

At the same time, many thoughtful members of Congress on both sides of the aisle recognize that domestic petroleum reserves continue on a steady decline. They realize that the market response will not be synthetic fuels development but increased importation of oil. Looking down the road, the U.S. and her oil-import depend- ent allies seem on the road toward increased dependence on the Persian Gulf. Apart from the disruption that can flow from a sudden interruption of supplies or sharp increase in price, this increased dependence on the fundamentalist states of the Middle East by the Western Alliance Countries well may be the legacy of failure to develop coal and shale-based alternative technology.

Even The Washington Post understands the situation. In an editorial two days ago entitled "Oil Trouble Ahead," The Post uses these words:

"The United States now accounts for one-fourth of the world's oil consumption, but has less than one-tenth of its oil reserves. It needs to move faster toward the alternatives to oil. Leaving the transition wholly to the market in the Reaganite Manner is too perilous; the market, with its falling prices, is currently--temporarily--sending out misleading signals. For any period beyond the next several years, geology provides a more realistic guide to the ultimate limits of the resources."

In the minds of many synfuels observers, it is time for the President to intervene. Such intervention could take many forms, of course. It could be in the form of a Saturday radio speech that might go something like this:

"There should be no doubt that my administration stands for less rather than more government. This applies to the role of government in the energy industry. You will recall that my first act as President in 1980 was to order the immediate decontrol of oil prices. This was and is the best way to signal consumption, exploration and distribution in our economy. But there is another aspect to the energy situation that I want to talk to you about today. It involves the inevitable drift toward increasing import dependence that will result from free market efforts to bring oil and petroleum products to the U.S. market at least cost. Because the world's oil is disproportionately located in the Middle East, it seems inevitable that western dependence on that oil will increase in the years ahead. The stability of politics in that region must recognize the importance of fundamentalist religious movements, the uncertainty of the situation in Iran following the inevitable death of the Ayatollah Khomeni, and the fragility of the Saudi Arabian kingdom. Because a free market energy policy is irrelevant to these concerns and because energy security in the United States is tied to these concerns, there is a role for government to play in laying the groundwork for the day in which the United States and her allies may be forced to choose between military efforts to secure access to oil on the terms we want, or to greater reliance on those fossil fuels we and our allies possess in abundance. There is no question that we stand ready militarily to defend our interests in the Middle East or wherever they may be threatened. However, in addition to my responsibilities as Commander-In-Chief, I believe I have a responsibility to do all that I can to make this a safer world, to defuse situations in advance, if at all possible, and to provide alternatives to the use of force wherever that may be possible.

"This I have chosen to do today as I call upon the leaders of the energy industry to join with us in developing the technology to produce oil and oil substitute fuels and chemicals from our abundant coal and shale resources. My hope is that working together we can provide technologies that will provide this great nation with a slower growing energy bill than will otherwise occur if we continue to import oil and leave the pricing decision to those who produce that oil in line with their own interests, not ours. The fruits of this program will be felt in fuller employment in our coal communities throughout the land. The environmental community is well aware of the direction of our efforts and I am happy to report that they fully recognize the benefits that these technologies promise in the containment of pollutants in the conversion processes themselves.

"Lastly, I want to assure the energy industry that, in launching this bold program, there is no intention to have government intrude into their industry beyond the temporary role we envisage. And we intend to leave once we have, together, proven the workability of these technologies and set the stage for further improvements in the private marketplace. This program I set in motion today has monumental implications for the security of our energy base in the decades ahead, for the strength of our economy, and for the cleanliness of our environment. It will require the full confidence of the energy industry and it will require solidarity among the leadership of the SFC. It is time for action!"

In truth, I don't expect that speech to be given. But let me tell you this. We have reached a critical point in the life of the SFC.

Private companies have put billions of private dollars into synthetic fuels research and development and construction, in response to a law passed with broad bipartisan support by both Houses of Congress and signed into law by President Carter five years ago. Industry has responded in good faith to solicitation after solicitation put out by Presidential appointees.

There are good candidate projects before the SFC. Success is within the reach of the reconstituted Board of Directors. But failure could occur soon. Valiant efforts are underway tonight to produce success.

Should failure occur, the finger of blame will be pointing.

- Was the law faulty?
- Was the economic climate too severe?
- Was the program mis-handled, poorly implemented, perhaps set-up to fail?

Fairly or not, I suspect implementation will reap much of the blame should the SFC fail.

Now, let's be frank. The government synfuels program in the U.S. is under the direction of the Reagan Administration. The Board appointees, the level of White House support, the quality of implementation cannot be blamed on the Congress or shifted back to President Carter.

The solid progress we celebrate here at this conference can continue. If, as I deeply hope, the SFC succeeds in broadening the base of commercial scale synfuels process knowledge, then the Reagan Administration justifiably can accept the applause that will follow.

It is now time for the SFC Board of Directors to submerge personal struggles and come together with solidarity behind a program in keeping with their recently announced business plan and apparently well within their reach.

Time is short...the stakes are high...the spotlight of responsibility is focused and it is bright. With luck, we in the U.S. will give synthetic fuels development the support that is so clearly evident in the excellent papers from our colleagues abroad.

Let's keep up the good work and continue to work together.

Ladies and gentlemen, I thank you for your attention.